



The Oil DROP

The U.S. EPA's Oil Spill Program Internal Report

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Dispersants and the *Brazilian Marina* Incident

In January 1978, the Liberian tanker *Brazilian Marina* struck a submerged rock while maneuvering in the channel of São Sebastião, State of São Paulo, Brazil. Investigations revealed that the

amount of Kuwait crude spilled was approximately three million gallons. Prevailing winds and currents carried the oil in a northeasterly direction (see map on page 2), causing pollution of the coastal embayments and beach areas in the States of São Paulo and Rio de Janeiro. The most severely impacted areas were those in Ubatuba, São Paulo, and the coastline along the southwestern shore of the State of Rio de Janeiro.

In an attempt to protect the beaches in the area, undiluted dispersants were used on the shoreline. One-hundred drums (about 5,500 gallons) of BRAS-X-Plus, containing a petroleum hydrocarbon base, were applied directly to the shore. Dispersants are chemicals that are used to speed up the process of natural dispersion. They work much like household detergents by breaking up oil into very small droplets that disperse into the water column. The dispersed oil is then degraded by micro-organisms. These chemicals may be effective in breaking up oil on the surface of water, but are useless in cleaning up beaches.

Due to misrepresentation of the dispersant's chemical composition, effectiveness, recommended application rates, and limitations, it was apparent that the dispersant was used incorrectly in this case. This

action resulted in the superficial cleaning of the beaches, but caused other problems: the zone of oil contamination was expanded; the subsequent mechanical removal was complicated; and the oil persisted longer in the environment. Oil on the dispersant-treated beaches also penetrated the sand up to two feet, depending on the nature of the sand, compared to two-inch penetration on non-treated sand.

The Companhia de Tecnologia de Saneamento Ambiental (CETESB), the State of São Paulo environmental agency, ordered this clean up approach ceased. CETESB recognizing the environmental and legal implications of this spill incident, requested the U.S. EPA's and U.S. Coast Guard's assistance in evaluating and characterizing the product used. Richard Dewling, Conrad Kleveno and Kenneth Biglane of the EPA; and William Monson and James Rivera of the U.S. Coast Guard, met with the governor of the State of São Paulo and other Brazilian specialists to devise a contingency plan for future incidents in the area. Follow-up studies conducted in August 1978, verified that detergent-treated oil persisted in the sand.

In the United States, federal authorization must be obtained in each case before the use of

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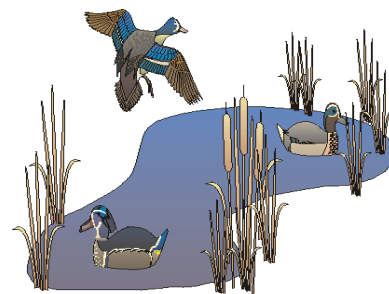
dispersants. They are most effective immediately after a spill, and on light- to medium-weight oils. Some countries rely almost exclusively on dispersants to combat oil spills; however, in the United States, dispersants have not been used extensively because of disagreements among scientists about their effectiveness, concerns about their toxicity, and difficulties with application. Dispersants are being further tested in laboratories, and are being designed to be more effective.

Great Lakes Spill Protection Initiative

The Great Lakes Spill Initiative was established as a government/industry

partnership to help protect the Great Lakes environment from oil spills by identifying oil spill prevention and response programs. The initiative promotes a cooperative work environment between the Great Lakes states (Michigan, Wisconsin, Illinois, Ohio, Minnesota, New York, Indiana, and Pennsylvania) and Amoco, BP America, Marathon, Mobil, and Sun Oil companies.

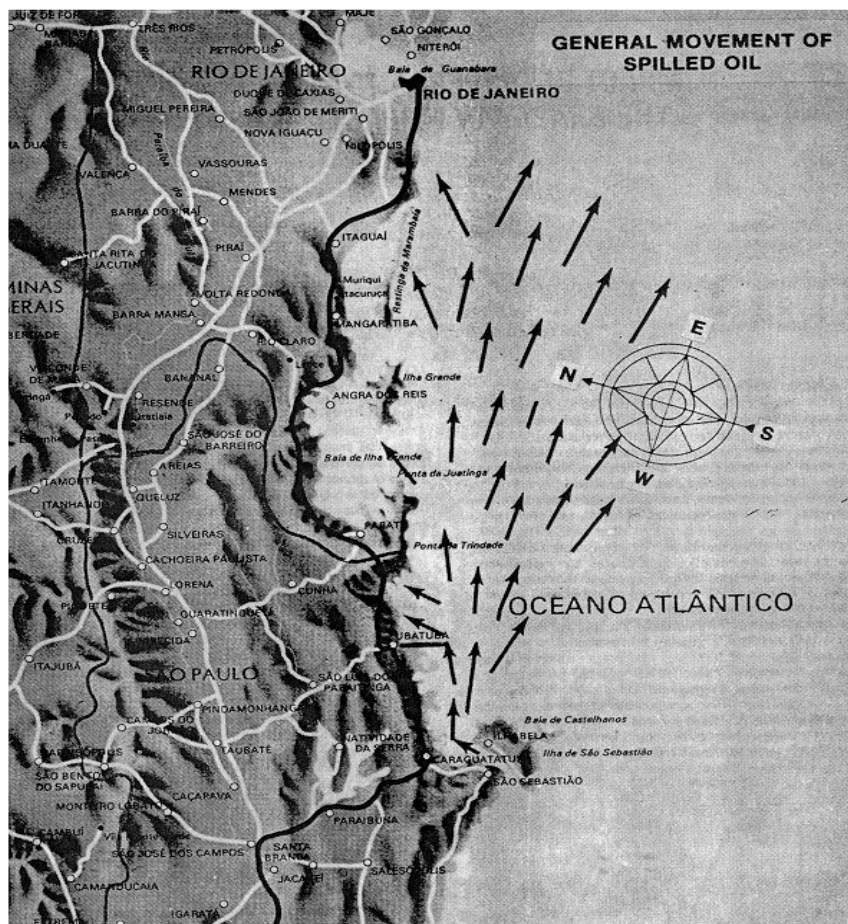
The Great Lakes Region consumes over 23 percent of the country's petroleum products annually, and has the capacity to refine over 20 percent of the nation's petroleum supply. As a result, large quantities of petroleum products are moved daily through tankers, pipelines, and



trucks to meet consumer and manufacturing demands.

The large volume of oil product movement increases the chance of oil spills and accidents. Between 1991 and 1995, an average of 25 spills of 10,000 gallons or more occurred in the Great Lakes Region yearly. Most spills were smaller; 98 percent averaged less than 350 gallons. Even so, large and small spills take their toll on the environment and industry. Spill protection programs were enhanced through open communication and information exchange between industry and regulatory agencies, promotion of voluntary industry protection standards, and an underlying understanding of the link between economic development and environmental protection in the Great Lakes Region. Results of the government/industry cooperative effort has led to the realization of the need for safer production, transport, and storage of petroleum products; efforts to streamline oil-related programs and regulations; and the acceptance of industry responsibility in preventing spills and planning response programs.

For more information please contact the Great Lakes Commission by calling (313) 665-9135 or the Council of Great Lakes Governors at (312) 407-0177. If you have Internet access, you may want to visit their websites. Their addresses are ***www.glc.org*** and ***www.cglg.org***.



Movement of Spilled Oil in the Channel of São Sebastião

New Oil Sorbent Made from Banana Fibers

FyBX Corporation of Alanta, Georgia, has developed an effective natural alternative to synthetic sorbents which may provide superior qualities of hydrophobic sorption without the manufacturing and disposal problems encountered with synthetics. Using fibrous material derived from the wastes generated from banana harvesting, FyBX has developed a manufacturing process which produces a fiber with better oil absorbing qualities than synthetics (i.e., polypropylene) and other natural sorbents (i.e., peat moss, cellulose).

The Banana fiber has many benefits as an oil sorbent:

- The material absorbs up to 15 times its own weight in oil and petroleum products from land and water surfaces;
- It floats indefinitely regardless of oil content or water conditions;
- It is flame resistant (will not support combustion) in its natural form;
- It both absorbs oil and repels water; and
- Petroleum products can be recovered from the material, thus allowing recycling of recovered oil and of the sorbent products.

In testing conducted by Kiber Environmental Services, Inc., FyBX banana fiber performed well against peat moss (AutoZorb), and polypropylene in absorbing heavy crude (14 API), light crude (37 API), and diesel fuel (39 API). In each instance, FyBX was shown to absorb more total oil per gram, and to be able to absorb a full barrel of oil with

less product than both the peat moss (AutoZorb), and the polypropylene. All testing was performed by Kiber Environmental Services, Inc. in triplicate to ensure reproducible data, and is currently being replicated by the United States Department of Agriculture, Fibers Research Group.

FyBX is easily produced from the waste product of bananas, and, therefore, benefits from being a recycled product itself. It appears to exceed current standards for oil sorption, and, if tests can be replicated by the USDA, FyBX banana fiber could be an important tool against oil spills. In addition, FyBX Vice President Tracy Bergquist, said that independent tests are being conducted by laboratories in Atlanta to investigate the possibility of pesticides and residual contaminants found in the agricultural wastes. These contaminants could potentially be leached into the water while absorbing oils. For more information, contact FyBX Corporation at (770) 242-8024 or fybx@kiber.com.

This article is written solely for educational purposes, and is not intended to be an advertisement for any particular product.

Roles and Responsibilities of Natural Resource Trustees

A trustee of natural resources acts on behalf of the members of a nation, a state, a tribe, or a foreign country for the purposes of assessing damages due to injury to natural resources, procuring compensation from the responsible party through negotiation

or litigation, and developing and implementing a plan for restoration of injured resources. Natural resources which fall under trusteeship include land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other resources which are owned, managed, held in trust by, appertaining to, or otherwise controlled by the United States, a state or local government, a foreign government, or a tribe. An injury to natural resources is any measurable, long or short-term, adverse change in the chemical or physical quality of the viability of the resource resulting from a discharge of oil or release of a hazardous substance. Damages are the amount of money sought by the trustee to compensate the public for injury to natural resources.

Trustees may be federal officials, such as the Secretaries of Interior, Agriculture, Defense, and Energy, designated by the President as land-managing agencies for natural resources. Trustees may also be state officials as designated by Governors. Tribes may designate officials as trustees for tribal lands and natural resources or may request the Bureau of Indian Affairs to act as the trustee.

Trustees are responsible for participating in National Response System preparedness and response activities. Among trustee responsibilities within the preparedness component of the system are the following:

- Participating on area committees to identify natural resources and strategies for their protection or treatment, and
- Obtaining Department of Interior and Department of Commerce preapproval for application of countermeasures or removal actions for discharges.

Trustee responsibilities during response activities include the following:

- Working with On-Scene Coordinators (OSCs) or Remedial Project Managers on removal actions;
- Providing technical support to OSCs on appropriate response techniques for environmentally sensitive areas;
- Providing technical and scientific expertise to assist OSCs in evaluating risks from discharges and designing risk-reduction measures;
- Providing advice to OSCs regarding trustee resources that are potentially affected by a discharge of oil, including recommending preapproved response techniques; and
- Assisting/leading wildlife rescue and rehabilitation.

Trustees ensure that responsible parties provide funds to restore natural resources which have been injured. Within the trustee's damage assessment and restoration responsibilities are:

- Assessment of the type and level of injury to resources through collection and analysis of data;
- Development of a restoration plan; and
- Implementation of the restoration plan through performance or funding by the responsible party.



Documenting an Oil Spill

Oil spill documentation is a critical step in the mitigation and remediation process that not only supports regulatory compliance and legal reference, but also acts as a measure for insurance and cost substantiation. Documentation provides the potential to review the incident in detail to improve future responses and enhance contingency plans.

Daily Log

The foundation of the documentation of any oil spill incident is the daily log. A dedicated work assignment is recommended for recording a conclusive daily log. The log should describe the spill situation and the remediation actions from the time the spill occurred or was first noticed, through the completion of operations. Bound notebooks are recommended over loose leaf pages for legal reasons. Each entry should include the date, time, place, action, and signatures or initials of appropriate personnel.

A full description of the extent of the spill is recommended; the limits of the spill, any damages (including life, property, or wildlife) that occur, warnings or mitigation procedures, and cleanup operations should be reported and described. Names and addresses of property or livestock owners, or victims should be recorded.

Documentation of cleanup operations should be highly detailed. Documentation should include the equipment and manpower used, actions taken, and assessment of efforts. All correspondence, orders, and directions on decision-making events should be recorded.

Manpower and equipment documentation should include timesheets and inventories of materials used.

A list of all persons at the spill scene, all costs incurred, and all conversations with non-project persons should be documented. An estimate of the source of the spill, the material recovered, and an assessment of damages should be documented as well.

Oil Sampling

Due to the legal implications of an oil spill and the resulting mitigation and remediation measures, sampling is a critical step in documentation. Every oil has a unique composition based on its history, so sampling efforts will assist in verifying the source of the oil. Samples should be taken based on the most current oil spill sampling procedures, and sample material kits should be stocked accordingly. Reference samples should be taken from every possible spill source to determine the oil's origin. Reference samples should be thoroughly documented, including place of origin, nature, and reason for sampling; this information should be in writing, witnessed, and legally valid.

Other Media

Still photographs and audio or video tape recordings should be used to further document the spill and remediation efforts. A 35mm camera is recommended for still photography, though a Polaroid or instant photo could be used as well. Pictures should be documented with the following information: date and time of the photo; the name and location of the site, vessel, or facility, with references to any outstanding landmarks; names of photographer or witnesses; and a description of the subject. Legal interests may require information on camera type, film

speed, and exposure as well. Audio taping may be substituted for written documentation when warranted (for example, if weather conditions are severe or if the documenter is recording from a remote location) if the audiotapes are transcribed daily. Videotapes further enhance the documentation record and add additional perspective.

Quantity of documentation

Overdocumentation is recommended, as it will minimize the chance that important information or details will be omitted. Redundant systems, such as using a 35mm camera as well as a Polaroid, or a still camera and a video camera, are recommended.

Types of Oils Associated with Oil Spills

(Condensed from Duckworth & Perry, 1986)

Any oil that is shipped or stored is subject to accidental discharge. An understanding of physical and chemical properties of general types of oil helps to predict the oil's behavior in the event of a spill and allows for more effective and better prepared emergency response. General oil types and characteristics are described below:

Crude oil is oil in its original form. It is the oil normally associated with oil spills, such as tanker accidents, exploration and production rig blowouts, and pipeline and storage tank leaks. Evaporation and chemical/biological degradation are some of the physical and chemical processes that rapidly change the composition of discharged crude oil.

Petroleum distillates, such as gasoline, kerosene, gas oil, and certain fuel oils, are refined from crude oil through a distillation process. Because of their high evaporation rates, these oils are not persistent. Gasoline has the highest evaporation rate; kerosene and gas oil follow.

Lubricating oils are relatively non-volatile in comparison to other petroleum distillates. Lubricating oils do not have high evaporation rates and remain on the sea surface. Waste oils, i.e., used lubricating oils, often contain suspended solids and oxidized material.

Black fuel oils are usually characterized as dense, viscous distillation residues or blends of residue and lighter distillates used for ship fuel and heating. Their physical behavior on the sea surface is similar to weathered crude oil.

Mixed oils include oily water effluents from ship bilges where waste oils accumulate. Bilge effluent is supposed to be discharged to an appropriate receiving facility; however, a lack of receptive facilities or other circumstances may lead to illegal discharges at sea. Mixed oil discharges also occur during deballasting operations or from activity at oil extraction, refinery, or storage facilities.

Nonpetroleum oils are any vegetable or animal oils that are carried in bulk, including animal renderings, fish, palm, corn, soybean, coconut, rapeseed, sunflower, or olive oil. These oils can be toxic to aquatic species, often produce foul odors, and can clog treatment facilities or other manmade structures.

Issues in Pipeline Safety

Safety for human health and the environment is a top priority for the Department of Transportation's Office of Pipeline Safety (OPS). Two recent announcements – one dealing with a new pipeline mapping system, the other with the year 2000 (Y2K) computer problem – address the safety of pipeline transportation:

National Pipeline Mapping System

A new digital pipeline mapping system



covering 500,000 miles of U.S. pipelines will aid in emergency response to pipeline failure. The system provides guidelines to operators for submitting accurate pipeline location data so that the information can be used in the case of an emergency. The system will eventually show not only the location and selected attributes of U.S. pipelines, but will also include information on population; unusually sensitive areas; natural disaster probability and high consequence areas; hydrography; and transportation networks. The system was created by a mapping quality action team sponsored by the Department of Transportation's Research and Special Programs Administration, the American Petroleum Institute, and the Interstate Natural Gas Association of America. There will be a mapping workshop held in Washington, D.C., on October 28-29, 1998, to help educate the pipeline industry. For more information, contact Christina Sames at (202) 366-2392, or see the OPS's webpage at ops.dot.gov.

Impacts of Y2K

Another safety issue involves Y2K. Computers may fail when the year 2000 arrives, because programs may interpret "00" as the year 1900 rather than the year 2000. Y2K may cause problems in the pipeline industry because many operators have automated their safety-related functions as well as other systems. Pipeline operators are encouraged to share information and solutions on the Y2K problem; a list of contacts can be found at ops.dot.gov. For more information, contact Roger Little in the OPS at (202) 366-4569.

China Floods

Floods in China, prompted by unusually heavy rains, have threatened oil fields in both Daqing and Jilin. According to officials, this flooding, the worst in 44 years, has already been the cause of 2,000 deaths nationwide and is expected to create losses of \$24 billion. The immediate concern in mid-August was an excessively full reservoir that was threatening the oil-rich Daqing region of Heilongjiang province. "About 80 percent of the oil fields are in the middle and north of Daqing, so if the dam of the reservoir bursts, all these oil fields will be affected," a Daqing official said. More than 1,200 oil wells were inundated, and 527 stopped production completely. Chinese officials are very concerned about protecting the Daqing oil fields because it is a major center of oil production in China. There are 25,000 wells in the region, and the 60.9 million tons of oil produced there last year is estimated to be at least one-third of the country's total oil production.

The government-controlled media has given scarce information on flood damage and deaths, but rather

has emphasized efforts to fight the flood. The state-run Xinhua News Agency has said that deforestation and silting of lakes along the Yangtze were partly to blame for the devastating floods. "Soil erosion caused by the random cutting of trees and the damage done to vegetation on the upper reaches have made the flooding worse," it said.

Canadian Wildlife Service Finds More Efficient Detering Device

In 1996, the Canadian Wildlife Service (CWS) announced the development of a new deterrent device, the Breco buoy, to disperse aquatic birds following an oil spill. Field tests conducted at the time revealed great effectiveness in scaring away marine birds, primarily molting sea ducks. The buoy was able to rapidly decrease (within 15 minutes) the number of birds present within a 700-meter radius by 85 percent. The buoy was recommended to be used as a drifter following an oil spill in areas heavily

frequented by aquatic birds in order to substantially decrease mortality.

An experiment with the buoy was also conducted in California. Field trials were designed to examine the effectiveness of the scarer in deterring waterbirds, predominantly surf scoter and scaup, from a local area in the northern San Francisco Bay estuary during the spring of 1996. The field trials suggested that the device had only a limited range of effectiveness on non-molting waterbirds.

In 1998, the CWS individually tested all of the 30 different sounds emitted by the buoy. It conducted 138 field tests on 204 groups of birds, including 29,000 individuals belonging to 17 species, during the spring migration of aquatic birds along the St. Lawrence River in Quebec. This new study revealed that the majority of sounds emitted by the old buoy were indeed inefficient to substantially deter non-molting aquatic birds at large distances. Range of efficiency was often less than 200 meters. Only 15 percent of the birds were successfully dispersed (swimming or flying away).



Following those results, the CWS decided to modify the sequence of sounds produced by the buoy in order to get a better response from non-molting birds. The best performing sounds originally produced by the buoy were kept, and bangers sounds, as well as alert calls of gulls, dabblers, and geese, were added. The sequence emitted and tested was then a combination of 18 different sounds that could last 6.3 minutes (instead of a sequence, lasting between 20 and 50 seconds). The maximum intensity at 1 meter remained at 130 dB.

The new combination of sounds was tested 49 times on 84 groups of birds, including 8,000 birds belonging to 23 species during their 1998 spring migration along the St. Lawrence River. The new sequence successfully dispersed 74 percent of all non-molting birds, instead of 15 percent with the initial sounds. Successful deterring was noted for estimated distances ranging between 50 meters and 1 kilometer. However, the duration of sound emissions had to be increased by an average of 1 minute to be efficient for larger distances (greater than 500 meters). All species answered positively and relatively rapidly to the scarer (duration of bird dispersion between 30 seconds and 6.3 minutes, with an average of 3.5 minutes). Efficiency of the scarer was significantly reduced when heavy winds prevailed (greater than 30 km/hour) or when birds were confined to very secure habitats (small ponds). No studies were conducted to assess the lasting effect of deterring.

The newly designed buoy will be able to frighten non-molting birds more successfully, provided it fulfills the following four major requirements:

- Sounds produced at a high intensity: up to 130 dB;
- Diversity of sounds, including bangers sounds and alert calls of gulls, dabblers, and geese;
- Signal length of at least 2 minutes and ideally of 3.5 minutes and even more so as to be able to deter birds at great distances; and
- Variety of sounds included in each signal: 10-12.

The CWS still highly recommends the use of the new buoy early during the deterring operations, especially if offshore birds are located in the area of the spill, in order to substantially decrease bird mortality and bird cleaning efforts, as well as the related costs.

For further information on the buoy, please contact Denis Lehoux, with the Canadian Wildlife Service at (418) 648-2544.

News Drops

Olive-fueled plant to be built in Spain

Four companies in Spain will build the country's first olive-fueled electricity generation plant. The fuel has been used in homes and some industries because it has high energy and low humidity. The plant will be located in Ciudad Real, near where most of Spain's olives are grown, and will run on the wastes from the production of olive oil. The companies intend to burn about 83,000 tons of olive waste each year, equivalent to 30,000 tons of oil.



Alaska pipeline adds new response equipment

New equipment has been acquired by the operator of the trans-Alaska oil pipeline to improve emergency response capability in Prince William Sound. Two new tractor tugs will help escort oil tankers into and out of Valdez, the site of the pipeline's marine terminal. The tugs will also be available to aid distressed or disabled tankers. In addition, a new cargo plane and an aerial dispersant delivery system can deliver up to 5,000 gallons of dispersant to a spill in less than three hours. Alaskan governor Tony Knowles, whose administration wants to develop the world's safest crude oil transportation system, said in a press release, "With the latest improvements...we're much closer to achieving our goal."

Alaska oil reserve may be opened to drilling

The largest untapped government oil reserve may be opened to production under a Clinton administration plan. The reserve covers 23 million acres and extends 100 miles along the arctic coastal plain. Neither conservationists nor the oil industry seem to be happy about the plan. Conservationists argue that there is enough oil worldwide at a low enough price that the reserve does not need to be tapped, considering the potential environmental harms. The oil industry, meanwhile, feels that the plan has too many restrictions aimed at protecting wildlife habitat. Department of Interior spokesman Michael Gauldin said, "We expect [the plan] will please neither side."

Visit the Oil Spill Program at:

<http://www.epa.gov/oilspill>

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Environmental Protection
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